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FIVE NEW SPECIES AND A NEW RECORD OF COSTA RICAN *LEPTONEMA* GUÉRIN (TRICHOPTERA: HYDROPSYCHIDAE)

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Abstract.—Eighteen species of the genus *Leptonema* (Trichoptera: Hydropsychidae: Macronematinae) are reported from Costa Rica. In this paper, five additional undescribed species of *Leptonema* from Costa Rica are diagnosed, described and illustrated: ***L. clorito, L. flintorum, L. huismanae, L. rafita,*** and ***L. tapanti.*** Their distribution records in Costa Rica are mapped. Also, *L. cheesmanae* Mosely is illustrated and recorded from Costa Rica for the first time.

Resumen.—El género *Leptonema* (Trichoptera: Hydropsychidae: Macronematinae) presenta dieciocho especies en Costa Rica. En el presente manuscrito se ofrecen las diagnosis, descripciones e ilustraciones de cinco especies no descritas de *Leptonema* presentes en Costa Rica: ***L. clorito, L. flintorum, L. huismanae, L. rafita,*** y ***L. tapanti.*** Se trazan en el mapa los registros de distribución en Costa Rica de estas especies. Además, se informa y se trazan en el mapa los primeros registros de distribución en Costa Rica de *L. cheesmanae* Mosely, la cual también es ilustrada.

Key Words: *Leptonema*, Trichoptera, caddisfly, new species, Costa Rica, Neotropics, taxonomy

The genus *Leptonema* Guérin is one of the best known and most easily recognized of the Neotropical caddisflies. The adults are large (10–40 mm) with light brown to light green translucent wings. Some species have black spots or small areas of dark coloration on the forewings. In the New World, the genus is widely distributed from southern North America through Central and South America, including the islands of the Antilles (Flint et al. 1987). Species also occur in Africa and Madagascar.

The genus was established by Guérin (1843) for the Brazilian species *Leptonema pallidum*. In 1914, Banks reported *Leptonema albovirens* (Walker) from Costa Rica, the first record of the genus for Costa Rica. Mosely (1933) recorded two additional species from Costa Rica in his revision of the genus. Flint, McAlpine, and Ross (1987) provided an exhaustive taxonomic review of the world species, and also considered phylogenetic and biogeographic aspects. They described 48 new species, four of them from Costa Rica, and recorded five additional species from the country. Holzenthal (1988) added six additional species records. In total, eighteen species of *Leptonema* have been recorded in Costa Rica, (Table 1).

In addition to the described species, five undescribed species of *Leptonema* were found in collections made in Costa Rica from 1986 through 1992 by R. W. Holzen-

Table 1. List of *Leptonema* species and species groups, defined by Flint et al. (1987), recorded in Costa Rica, with distribution records as published by Flint et al. (1987) and Holzenthal (1988).

Species	Distribution
Crassum Group	
L. crassum Ulmer 1905	Mexico; Guatemala; Honduras; Nicaragua; Costa Rica: Alajuela, Guanacaste, Heredia, Limón; Panama; Colombia; Venezuela; Brazil; Peru; Paraguay; Argentina.
L. divaricatum Flint, McAlpine, Ross 1987	Costa Rica: Limón; Colombia; Venezuela; Ecuador.
Stigmosum Group	
L. tapanti, new species	Costa Rica: Cartago; Panama.
Plicatum Group	
L. ekisi Flint, McAlpine, Ross 1987	Costa Rica: Alajuela, Cartago; Panama.
L. flintorum, new species	Costa Rica: Puntarenas.
L. fortunum Flint, McAlpine, Ross 1987	Costa Rica; Panama.
L. hanuli Flint, McAlpine, Ross 1987	Costa Rica: Cartago; Panama.
L. huismanae, new species	Costa Rica: Alajuela, Guanacaste.
L. rafita, new species	Costa Rica: Alajuela, Cartago, San José.
L. salvini Mosely 1933	Costa Rica; Panama.
L. sinuatum Mosely 1933	Costa Rica; Panama; Colombia.
L. turrialbum Flint, McAlpine, Ross 1987	Costa Rica: Alajuela, Cartago.
L. vitum Flint, McAlpine, Ross 1987	Costa Rica: Puntarenas.
L. woldianum Flint, McAlpine, Ross 1987	Costa Rica; Panama.
Simulans Group	
L. asclepium Flint, McAlpine, Ross 1987	Costa Rica: Cartago, San José.
L. campanum Flint, McAlpine, Ross 1987	Costa Rica; Panama.
L. simulans simulans Flint, McAlpine, Ross 1987	Costa Rica: Alajuela, Cartago, Guanacaste, Puntarenas, San José; Panama.
Pallidum Group	
L. albovirens (Walker) 1852	USA: Texas; Mexico; Belice; Guatemala; Honduras; Nicaragua; Costa Rica; Panama; Colombia; Venezuela; Trinidad & Tobago; Granada; St. Vincent.
Complexum Group	
L. cheesmanae Mosely 1933, new record	Costa Rica: Alajuela, Guanacaste, Limón, San José; Panama; Colombia.
L. clorito, new species	Costa Rica: Alajuela.
L. complexum Mosely 1933	Costa Rica: Alajuela, Cartago, Limón; Panama.
L. forficulum Mosely 1933	Costa Rica; Panama.
L. furciligerum Flint, McAlpine, Ross 1987	Costa Rica: Puntarenas.
L. intermedium Mosely 1933	Costa Rica: Alajuela, Cartago, Heredia, San José; Panama; Colombia; Ecuador.

thal and his colleagues. In the present paper these species are diagnosed, described, and illustrated. Also, *L. cheesmanae* Mosely is illustrated and recorded from Costa Rica for the first time. Terminology used for genitalic structures follows that presented by Flint et al. (1987). This paper represents the results of an ongoing project, sponsored by the National Science Foundation and the University of Minnesota Insect Collection, to catalog and describe the caddisfly fauna of Costa Rica. Holotypes of the species described are deposited in the collections of the National Museum of Natural History,

Smithsonian Institution, Washington, DC (NMNH). Paratypes and other specimens examined, are deposited in the collections of the University of Minnesota Insect Collection, St. Paul, Minnesota (UMSP), the National Museum of Natural History, Smithsonian Institution, Washington, DC (NMNH), and the Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica, (INBIO). All specimens are pinned unless otherwise noted.

Leptonema clorito Muñoz-Q., new species

(Fig. 1, Map 1)

Diagnosis.—This species belongs within the *complexum* Group, as defined by Flint et al. (1987). It is very similar to *Leptonema cheesmanae* Mosely, but can be distinguished from that species by the shape of process "*d*" of the phallic apparatus. In *L. clorito*, process "*d*" consists of only the apical arm, which is elongate, slender, directed dorsally at base, and curved apically, as viewed laterally. In *L. cheesmanae*, process "*d*" consists of both apical and basal arms. In lateral view, the apical arm is elongate, curved, and directed posteriorly, the basal arm is slender, long, and projected anteriorly beyond of the apex of process "*e*" and the base of process "*f*". Finally, in *L. clorito*, the lateral lobes of segment X are triangular, as viewed dorsally; these are subquadrate in *L. cheesmanae*.

Description.—*Male:* Length of forewing 17 mm. Body sclerites pale yellow. Dorsum of head pale yellow and with short, light brown setae. Legs with fine, yellowish setae. Wings light green, translucent; forewing covered with fine, short, yellowish setae, with small rounded patch of brownish setae over area around anterior angle of medial cell; apical third of forewing slightly infuscate. Maxillary palpus with fifth segment about 3/5 length of basal 4 segments combined. Process of sternum V large, oval. *Genitalia* (Fig. 1): Segment IX, as viewed laterally, narrow, elongate, with V-shaped dorsal keel. Segment X with wart "*a*" elongate, base narrow, apex bulbous; wart "*b-1*" elongate, fingerlike; wart "*b-2*" short; wart "*c*" absent; lateral lobes, as viewed dorsally, triangular, projecting posteriorly; as viewed laterally, lateral lobes rounded, bearing short setae on lateral margin; ventral margin of segment X with hooklike lobe. Inferior appendage two segmented, basal segment slightly more than 4 times length of apical segment, widest subapically; apical segment with short setae on inner margin. Phallus with midsection long, tubular; apical section complex, bearing two, tiny, sharply pointed, sclerotized phallotremal sclerites behind process "*a*", visible in dorsal view; process "*a*", as viewed laterally, fingerlike, apex truncate, elevated and arched over process "*g*" and phallotremal sclerites; as viewed dorsally, process "*a*" tonguelike, apex truncate, lightly sclerotized, arising dorsomesally; processes "*b-1*" and "*b-2*" short, sharply pointed, lightly sclerotized, arising apically, and directed anterodorsally; process "*c*" long, slender, arising subapically, apex pointed, directed anteriorly, and reaching base of process "*a*"; basal stalk of process "*d*", as viewed laterally, erect, directed dorsally; apical arm of process "*d*" curved apically, arising dorsomesally; as viewed dorsally, basal arm of process "*d*" absent; apical arm bifurcated basally, its projections pointed, projected posterolaterally; process "*e-1*", as viewed dorsally, spinelike, short, apex rounded, arising dorsolaterally and projecting posterolaterally; process "*e-2*", as viewed dorsally, bifurcated, arising dorsomesally, its projections long, slender, slightly serrated, arched, projecting anteriorly, with pointed apices reaching base of process "*f*"; process "*f*" fingerlike, elongate, arising dorsomesally, apex rounded, reaching base of apical arm of process "*d*"; process "*g*" a ventrolateral lobe, broad, flat, rounded; as viewed dorsally, emarginated, with mesal projection, apex rounded and projected posteriorly; process "*j*" absent.

Type material.—Holotype: ♂, COSTA RICA: *Alajuela:* Cerro Campana, ca. 6 km

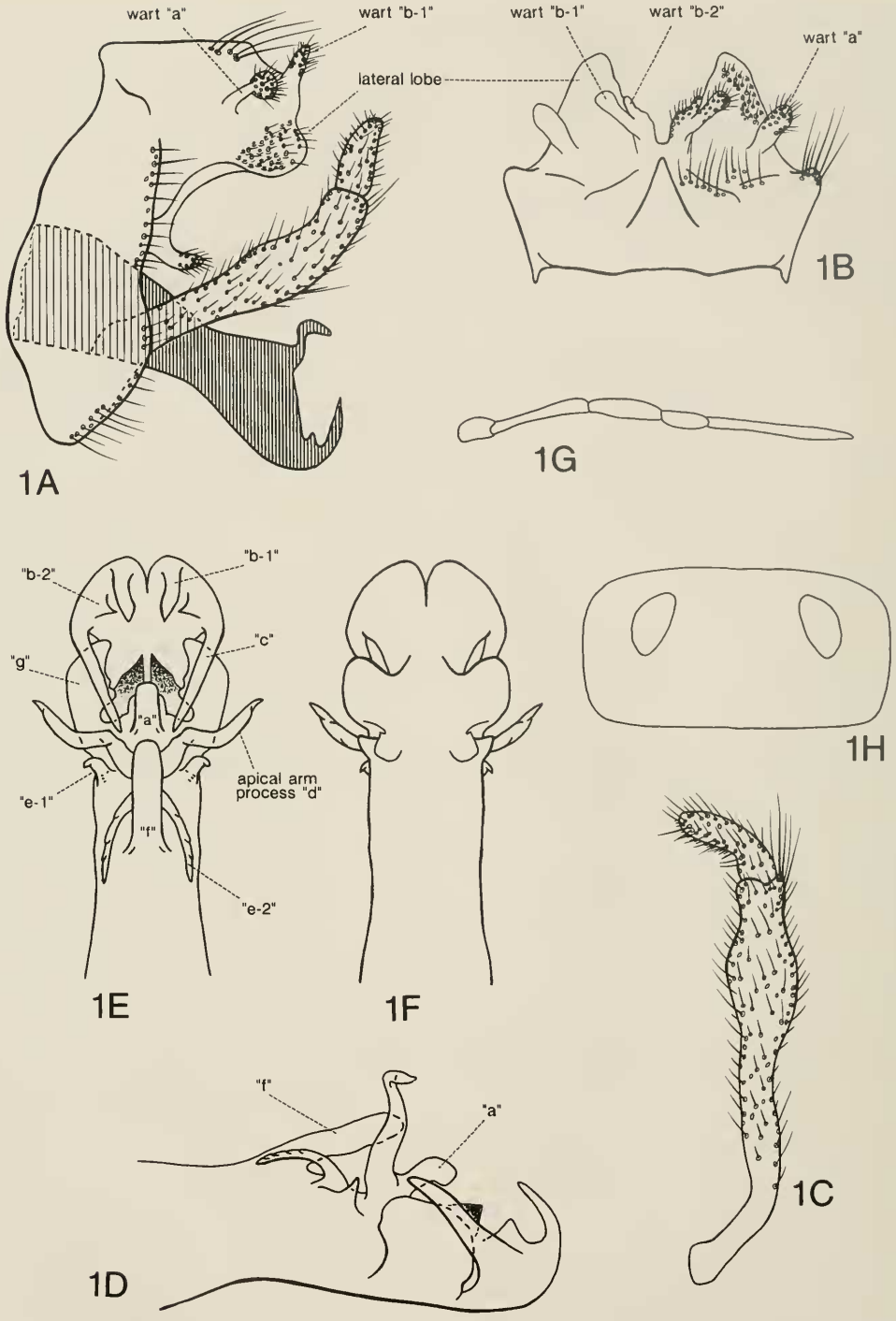

Fig. 1. *Leptonema clorito*, male genitalia. A, Lateral view. B, Segments IX, X, dorsal view. C, Inferior appendage, posteroventral view. D, Phallus, lateral view. E, Phallus, dorsal view. F, Phallus, ventral view. G, Maxillary palpus, lateral view. H, Sternum V, ventral view.

(air) NW Dos Ríos, 10.9°N, 85.4°W, el. 640 m, 15—16.iii.1986, Holzenthal and Fasth (NMNH).

Etymology.—Dedicated to the memory of Dr. Clodomiro Picado Twight (1887–1944), in recognition of his numerous and outstanding contributions to the biology of Costa Rica. Dr. Picado was known affectionately as "Clorito."

Leptonema flintorum Muñoz-Q., new species
(Fig. 2, Map 2)

Diagnosis.—This species is a member of the *plicatum* Group, as defined by Flint et al. (1987). It is very similar to *L. huismanae* n. sp., but differs in the shape and size of process "*g*" of the phallic apparatus. In *L. flintorum*, process "*g*" is narrow, elongate, distinctly concave dorsally, with a slightly rounded and slightly serrated apex, barely reaching the posterior margin of process "*b*". In *L. huismanae*, process "*g*" is larger, very broad, slightly concave middorsally, with a broad, rounded, serrated apex, generally extending beyond the posterior margin of process "*b*". Additionally, the midsection of the phallus of *L. flintorum* is wider than that of *L. huismanae*. Also, process "*e*" of the phallus of *L. flintorum* is more robust and conspicuous than the same process in *L. huismanae*. The pattern of brownish setae on the forewing of *L. huismanae* is darker than the pattern in *L. flintorum*. *Leptonema flintorum* has only been collected in the southern region of Costa Rica; *L. huismanae* has been collected in the central and northern regions of the country. Finally, *L. flintorum* and *L. huismanae* can be separated from *L. sinuatum* Mosely by the shape of process "*a*" and by the presence or absence of processes "*e*" and "*f*" of the phallus; these latter two processes also separate two the new species from *L. hamuli* Flint, McAlpine, and Ross. In *L. flintorum* and *L. huismanae*, process "*a*" arises dorsally, is broad, membranous, emarginate apicomesally and without conspicuous, dorsomesal, projections; in *L. sinuatum*, process "*a*" has a pair of conspicuous, dorsomesal, curved projections, which are directed anteriorly, In *L. flintorum* and *L. huismanae*, process "*e*" is present and process "*f*" is absent, as viewed dorsally. In *L. hamuli* and *L. sinuatum*, process "*e*" is absent and process "*f*" is present.

Description.—*Male:* Length of forewing 20–22 mm. Body sclerites pale brown. Dorsum of head pale brown with short, light brown setae. Legs with fine, light brown setae. Wings light brown, translucent; forewing covered with fine, short, brown setae, with darker brown setae along anal veins, and transverse band of darker brown setae over cord. Maxillary palpus with fifth segment more than ½ length of basal 4 segments combined. Process of sternum V large, oval. *Genitalia* (Fig. 2): Segment IX, as viewed laterally, narrow, elongate, with V-shaped dorsal keel. Segment X with wart "*a*" elongate, base narrow, apex bulbous; warts "*b-1*" and "*b-2*" elongate, base narrow, apex bulbous; wart "*c*" absent; lateral lobes, as viewed dorsally, sharply pointed, projecting posteriorly; as viewed laterally, appearing triangular, bearing short setae on lateral margin. Inferior appendage two segmented, basal segment more than 3 times length of apical segment; apical segment with short setae on inner margin. Phallus long, tubular; midsection bearing process "*e*" dorsolaterally, slightly narrower than apical section of phallus (apical section less than 1.5 times width of midsection); apical section bearing two, tiny, sharply pointed, sclerotized phallotremal sclerites behind process "*a*", visible in dorsal view; process "*a*", as viewed dorsally, broad, membranous, arising dorsally, and emarginate apicomesally; dorsal lobe of process "*a*" as viewed laterally, with small, lightly sclerotized point, directed dorsally; process "*b*" arising apicoventrally, slender, long, reaching the base of process "*e*", apex pointed; as viewed laterally, arched dorsally; process "*e*" spinelike, robust, conspicuous, arises dorsolaterally, apex pointed, directed anter-

Map 1. Distribution of *Leptonema cheesmanae*, *L. clorito*, and *L. rafita*.

odorsally (in lateral view, height of midsection of phallus less than 2.5 times length of process "*e*"); process "*g*" developed into narrow, elongate, apicolateral lobe, projecting posteriorly, as viewed dorsally, distinctly concave dorsally, apex somewhat rounded, lightly sclerotized, barely reaching posterior margin of process "*b*"; as viewed laterally, slightly serrated on dorsal and ventral margins; ventrally, with U-shaped, apicomesal emargination; processes "*c*", "*d*", "*f*" and "*j*" absent.

Type material.—Holotype: ♂, COSTA RICA: *Puntarenas:* Río Bellavista, ca. 1.5 km NW Las Alturas, 8.951°N, 82.846°W, el. 1400 m, 16–17.iii.1991, Holzenthal, Muñoz, Huisman (NMNH). Paratypes: COSTA RICA: *Puntarenas:* same data as holotype except, 1 ♂, 4 ♀ (UMSP); same except, trib. Río Bellavista, Las Alturas (road to quarry) 8.952°N, 82.848°W, el. 1480 m, 19.iii.1991, Holzenthal, Muñoz, Huisman, 1 ♂ (UMSP).

Etymology.—Named in honor of Dr. Oliver S. Flint and his wife, Mrs. Carol Flint, in recognition to their great labor in the study of the Neotropical caddisfly fauna and their help with the author.

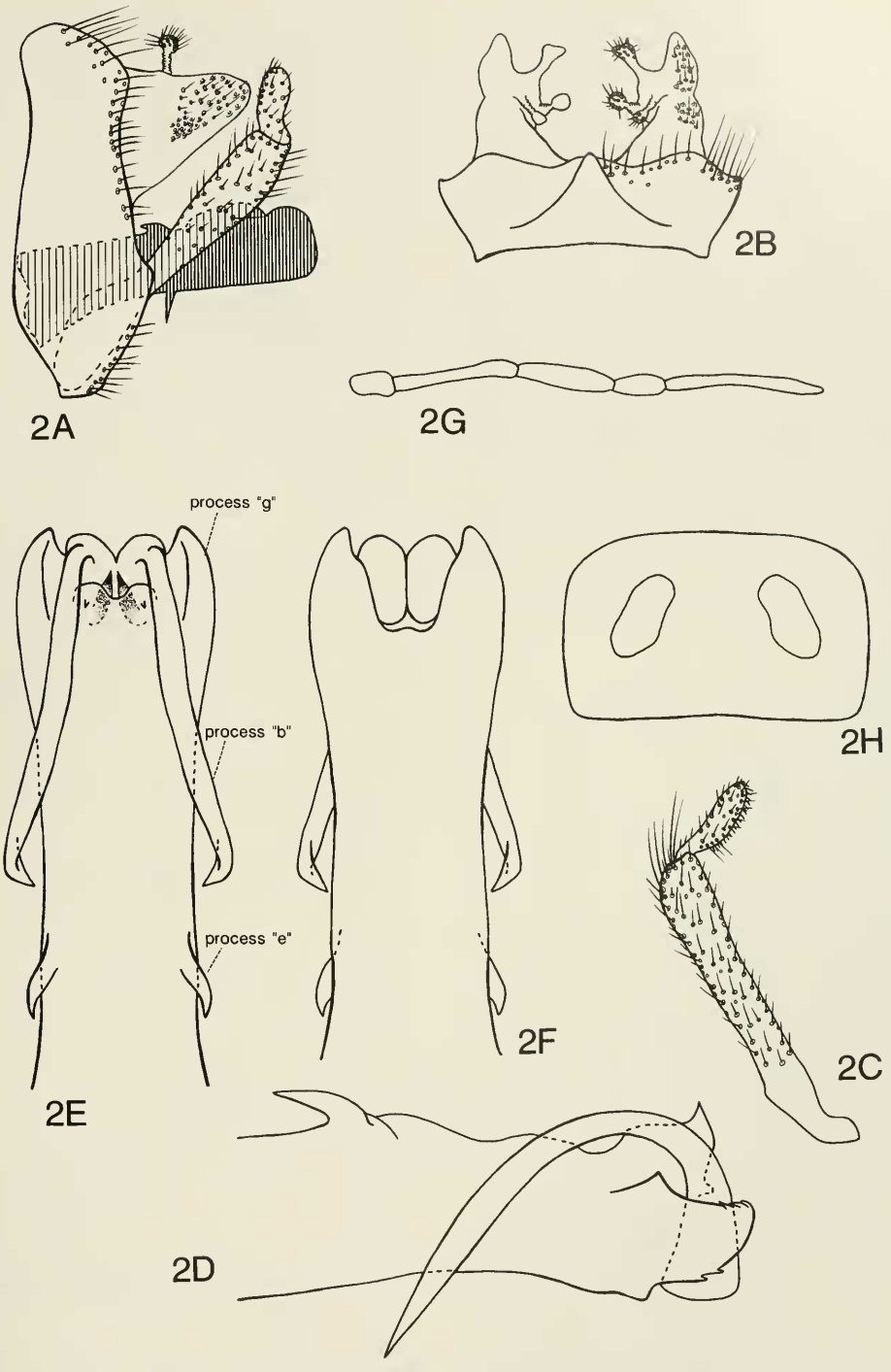

Fig. 2. *Leptonema flintorum*, male genitalia. A, Lateral view. B, Segments IX, X, dorsal view. C, Inferior appendage, posteroventral view. D, Phallus, lateral view. E, Phallus, dorsal view. F, Phallus, ventral view. G, Maxillary palpus, lateral view. H, Sternum V, ventral view.

Leptonema huismanae Muñoz-Q., new species
(Fig. 3, Map 2)

Diagnosis.—This species belongs within the *plicatum* Group of Flint et al. (1987). It is closest to *L. flintorum* n. sp., differing from that species in the shape and size of process "*g*" of the phallic apparatus, as well as in the size of process "*e*", and of the width of the midsection of the phallus. Also, these species can be distinguish by the pattern of brownish setae on the forewing, as discussed in the diagnosis of *L. flintorum*. Finally, *L. huismanae* can be distinguished from *L. sinuatum* Mosely by the shape of process "*a*" and by the presence or absence of processes "*e*" and "*f*" of the phallus, these latter two processes also separate it from *L. hamuli* Flint, McAlpine, and Ross, as described in the diagnosis of *L. flintorum*.

Description.—*Male:* Length of forewing 17–20 mm. Body sclerites pale brown. Dorsum of head pale brown with short, light brown setae. Legs with fine, light brown setae. Wings light brown, translucent; forewing covered with fine, short, brown setae, with small transverse band of brownish setae over basal third and with longer, darker, transverse band of brownish setae over cord and margins of medial cell. Maxillary palpus with apical segment more than ½ length of basal 4 segments combined. Process of sternum V large, oval. *Genitalia* (Fig. 3): Segment IX, as viewed laterally, narrow, elongate, with V-shaped dorsal keel. Segment X with wart "*a*" elongate, base narrow, apex bulbous; warts "*b-1*" and "*b-2*" elongate, base narrow, apex bulbous; wart "*c*" absent; lateral lobes, as viewed dorsally, rounded, projecting posteriorly; as viewed laterally, triangular, bearing short setae on lateral margin. Inferior appendage two segmented, basal segment slightly more than 3 times length of apical segment; apical segment with short setae on inner margin. Phallus long, tubular; midsection bearing process "*e*" dorsolaterally, distinctly constricted (apical section more than 2 times width of midsection); apical section distinctly broader, bearing two, tiny, sharply pointed, sclerotized phallotremal sclerites behind process "*a*", visible in dorsal view; process "*a*", as viewed dorsally, broad, membranous, arising dorsally, and emarginate apicomesally; dorsal lobe of process "*a*", as viewed laterally, with small, lightly sclerotized point, directed dorsally; process "*b*" arising apicoventrally, slender, long, extending beyond the base of process "*e*", apex pointed; as viewed laterally, arched dorsally; process "*e*" spinelike, short, arising dorsolaterally, apex pointed, directed anterodorsally, but in some specimens process "*e*" very short to minute (in lateral view, height of midsection of phallus more than 3 times length of process "*e*"); process "*g*" developed into large, very broad, apicolateral lobe, projecting posteriorly, as viewed dorsally, only slightly concave middorsally, apex broad, rounded, serrated, lightly sclerotized, normally extending beyond posterior margin of process "*b*", but in some specimens barely reaching beyond posterior margin of process "*b*"; as viewed laterally, dorsal, apical and ventral margins with many robust serrations, lightly sclerotized; as viewed ventrally, with U-shaped, apicomesal emargination; processes "*c*", "*d*", "*f*" and "*j*" absent.

Type material.—Holotype: ♂, COSTA RICA: *Alajuela:* Reserva Forestal San Ramón, Río San Lorencito and tribs., 10.216°N, 84.607°W, el. 980 m, 6—10.iii.1991, Holzenthal, Muñoz, Huisman (NMNH). Paratypes: COSTA RICA: *Alajuela:* same data as holotype except, 13–16.vi.1986, C.M. and O.S. Flint, Holzenthal, 11 ♂, 2 ♀ (NMNH); same except, 2–4.vii.1986, Holzenthal, Heyn, Armitage, 3 ♂, 3 ♀ (UMSP); same except, 5–9.vii.1986, I. and A. Chacón, 6 ♂, 2 ♀ (UMSP); same except, 2–6.ix.1986, I. and A. Chacón, 1 ♂, 1 ♀ (UMSP); same except, 24–27.ii.1987, I. and A. Chacón, 3 ♂, 1 ♀ (UMSP); same except, 30.iii.–1.iv.1987, Holzenthal, Halmilton, Heyn, 11 ♂ (4 in alcohol), 5 ♀

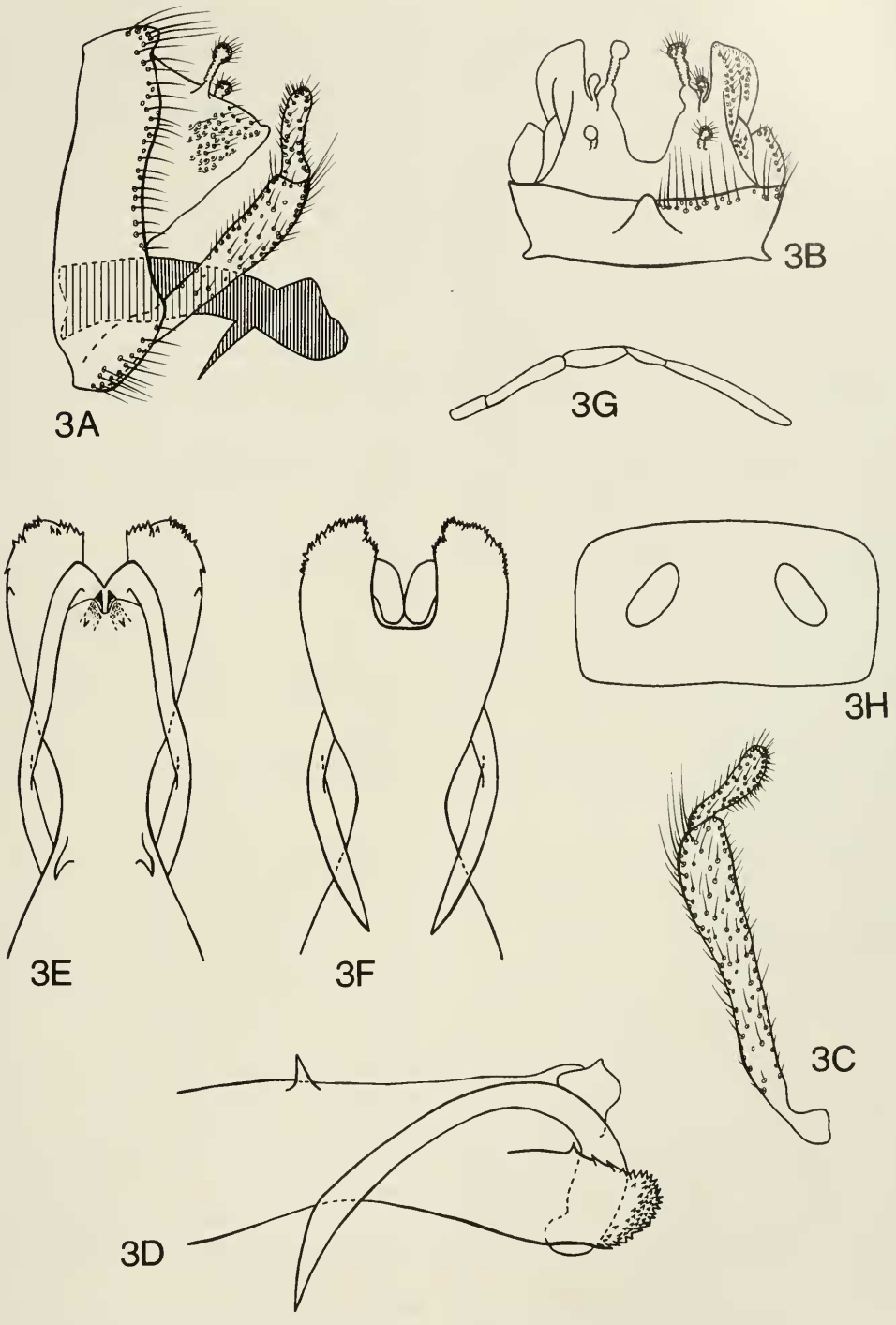

Fig. 3. *Leptonema huismanae*, male genitalia. A, Lateral view. B, Segments IX, X, dorsal view. C, Inferior appendage, posteroventral view. D, Phallus, lateral view. E, Phallus, dorsal view. F, Phallus, ventral view. G, Maxillary palpus, lateral view. H, Sternum V, ventral view.

(UMSP); same except, 1–4.v.1990, Holzenthal and Blahnik, 5 ♂ (1 in alcohol), 12 ♀ (UMSP); same except, 28–30.vii.1990, Holzenthal, Blahnik, Muñoz, 1 ♂, 1 ♀ (in alcohol) (UMSP); same data as holotype except, 7 ♂, 10 ♀ (UMSP); Río Sarapiquí, ca. 2 km SE Cariblanco, 10.299°N, 84.172°W, el. 710 m, 22.iii.1986, Holzenthal and Fasth, 1 ♂ (UMSP); same except, 6.ii.1987, I. and A. Chacón, 2 ♂, 2 ♀ (UMSP); Río Agrio, ca. 3.5 km NE Bajos del Toro, 10.243°N, 84.279°W, el. 1290 m, 20.viii.1990, Holzenthal et al., 1 ♂ (UMSP); *Guanacaste:* Parque Nacional Guanacaste, Río San Josecito, Est. Mengo [Estación Cacao], 10.922°N, 85.470°W, el. 960 m, 28–29.vii.1987, Holzenthal, Morse, Clausen, 8 ♂, 4 ♀ (UMSP); same except, Estación Cacao, lado suroeste del Volcán Cacao, [10°56′N, 85°26′W], el. 1000–1400 m, ix–xii.1989, URCG, R. Blanco, C. Chávez, 3 ♂ (INBIO); same except, vi.1990, II Curso de Parataxónomos, 14 ♂, 12 ♀ (INBIO); Z.[ona] P.[rotectora] Tenorio, tribs. Río San Lorenzo, 6 km NW Tierras Morenas [Tilarán], 10.61°N, 84.98°W, el. 900 m, 17–19.ii.1992, Holzenthal, Muñoz, Kjer, 3 ♂, 10 ♀ (UMSP).

Etymology.—Named in honor of Jolanda Huisman, in recognition of her great help with the Trichoptera of Costa Rica Project and for her friendship.

Leptonema rafita Muñoz-Q., new species

(Fig. 4, Map 1)

Diagnosis.—This species is also a member of *plicatum* Group, as defined by Flint et al. (1987). It is most similar to *L. ekisi* Flint, McAlpine, and Ross, *L. fortunum* Flint, McAlpine, and Ross, *L. salvini* Mosely, and *L. vitum* Flint, McAlpine, and Ross, differing from those species in the shape of process "*f*" of the phallic apparatus. In *L. rafita*, as viewed dorsally, process "*f*" arises dorsomesally and is round; as viewed laterally, it is short, erect, with an apex moderately rounded and directed dorsally; in *L. ekisi*, as viewed dorsally, process "*f*" is elongate, tonguelike, with its apex directed posteriorly; in *L. fortunum*, as viewed dorsally, process "*f*" is somewhat elongate, with a bifid apex directed posteriorly; in *L. salvini*, as viewed dorsally, process "*f*" is oval; as viewed laterally, it is short, and with its apex slightly rounded and directed dorsally; and in *L. vitum*, process "*f*" is absent. Also, process "*g*" of the phallus is unilobed in *L. salvini*, and it is bilobed in *L. rafita*, *L. ekisi*, *L. fortunum* and *L. vitum*. In addition, process "*g*" is different among the four species. In *L. rafita*, process "*g*" is short, lightly sclerotized, arising apicolaterally, directed posteriorly, and bilobed; as viewed laterally, the apical lobe of process "*g*" is erect, subtriangular, strongly serrated, projected posteriorly, with a pair of apical points that reach the posterior margin of the process "*b*"; the dorsal lobe of the process "*g*" is erect, subtriangular, slightly serrated, directed dorsally and with a pointed apex; in *L. ekisi*, process "*g*" is short, apicolateral, directed posteriorly and bilobed apically; as viewed laterally, the apical lobe is short, rounded, unserrated, projected posteriorly, and barely reaching the posterior margin of process "*b*"; the dorsal lobe is subtriangular, directed dorsally with small apical points; in *L. fortunum*, process "*g*" is elongate, apicolateral, projected posteriorly beyond the posterior margin of process "*b*", and bilobed apically; as viewed laterally, the apical lobe is subtriangular, unserrated, with a pointed apex and directed posteriorly; the dorsal lobe is erect, subtriangular, unserrated, with a pointed apex and directed dorsally; in *L. salvini*, process "*g*" is unilobed, short, apicolateral; as viewed laterally, projected posteriorly, reaching the posterior margin of process "*b*"; the apical lobe is absent; and the dorsal lobe is erect, subtriangular, dorsoapical, and directed dorsally; and in *L. vitum*, process "*g*" is elongate, apicolateral, projected posteriorly beyond of posterior margin of process "*b*", and bilobed; the apical lobe, as viewed laterally, is large, quadrate, serrated posterodorsally and di-

rected posteriorly; as viewed dorsally, with apex directed posteromesally and the dorsal emerging mesally; the dorsal lobe, as viewed laterally, is erect, slender, and directed dorsally. Finally, in both *L. rafita* and *L. salvini*, process "*e*" of the phallus, as viewed laterally, reaches the base of the process "*f*"; in *L. ekisi*, it does not reach the base of process "*f*" and in *L. fortunum*, it is absent. Finally, in *L. vitum*. process "*f*" is absent.

Description.—*Male:* Length of forewing 20–23 mm. Body sclerites pale brown. Dorsum of head pale brown with short, light brown setae. Leg segments with fine, light brown setae. Wings light brown, translucent; forewing covered with fine, short, brown setae, with small, rounded patch of brownish setae over posterior margin of medial cell. Maxillary palpus with apical segment more than ½ length of basal 4 segments combined. Process of sternum V large, oval. *Genitalia* (Fig. 4): Segment IX, as viewed laterally, narrow, elongate, with V-shaped dorsal keel. Segment X with wart "*a*" short with short setae; wart "*b-1*" short with short setae; wart "*b-2*" elongate, base narrow, apex bulbous; wart "*c*" absent; lateral lobes, as viewed dorsally, rounded, projecting posteriorly, bearing short setae; as viewed laterally, rounded, bearing short setae on lateral margin. Inferior appendage two segmented, basal segment more than 3 times length of apical segment; apical segment with short setae on inner margin. Phallus with midsection long, tubular; apical section bearing two, tiny, sharply pointed, sclerotized phallotremal sclerites behind process "*a*", visible in dorsal view; process "*a*", as viewed dorsally, subtriangular, membranous, arising dorsomesally, and emarginate apicomesally; as viewed laterally, with margin rounded; process "*b*" long, broad, tubular, sinuous, emerging apicoventrally, apex rounded, with small point, reaching base of process "*f*", posteroventral section serrated, lightly sclerotized, as viewed laterally, arched, elevated over process "*e*", projecting anteriorly; process "*e*" dorsolateral, fused to phallobase, with elongate, lateral row of spicules and ending in membranous, rounded, dorsolateral, spiculose lobe, reaching base of process "*f*", as viewed laterally; process "*f*", as viewed dorsally, rounded and arising dorsomesally; as viewed laterally, short, erect, apex moderately rounded, directed dorsally; process "*g*" apicolateral, short, lightly sclerotized, directed posteriorly, bilobed; apical lobe of process "*g*" as viewed laterally, subtriangular, erect, strongly serrated, projected posteriorly, with pair of apical points reaching posterior margin of process "*b*"; dorsal lobe of process "*g*" subtriangular, erect, slightly serrated, with apex pointed directed dorsally; ventrally, with deep, serrated, U-shaped, apical emargination; processes "*c*", "*d*" and "*j*" absent.

Type material.—Holotype: ♂, COSTA RICA: *Alajuela:* Río Peje and falls, ca. 1 km SE San Vicente, Ciudad Quesada, 10.277°N, 84.388°W, el. 1450 m, 14–15.ii.1992, Holzenthal, Muñoz, Kjer (NMNH). Paratypes: COSTA RICA: *Alajuela:* Río Toro, 3.0 km (road) SW Bajos del Toro, 10.204°N, 84.316°W, el. 1530 m, 11.ii.1992, Holzenthal, Muñoz, Kjer, 1 ♂ (UMSP); same data as holotype except, 4 ♂, 4 ♀ (UMSP); *Cartago:* Reserva Tapantí, Río Grande de Orosi, 9.686°N, 83.756°W, el. 1650 m, 15–16.vii.1987, Holzenthal, Morse, Clausen, 1 ♂ (UMSP); same except, Quebrada Palmitos and falls, 9.72°N, 83.78°W, 1400 m, 1–2.viii.1990, Holzenthal, Blahnik, Muñoz, 1 ♂, 1 ♀ (UMSP); same except, 21.ii.1992, Holzenthal, Muñoz, Kjer, 1 ♂, 1 ♀ (INBIO); same except, waterfalls, ca. 1 km (road) NW tunnel, 9.69°N, 83.76°W, 1600 m, 2–3.viii.1990, Holzenthal, Blahnik, Muñoz, 1 ♂ (NMNH); *San José:* trib. to Quebrada Caraigres 3.6 km (road) SW La Legua, 9.728°N, 84.125°W, el. 1650 m, 23.i.1992, Holzenthal, Kjer, Quesada, 2 ♂ (UMSP).

Etymology.—Named in honor of Dr. Ralph W. Holzenthal, who first introduced me to the Neotropical caddisfly world.

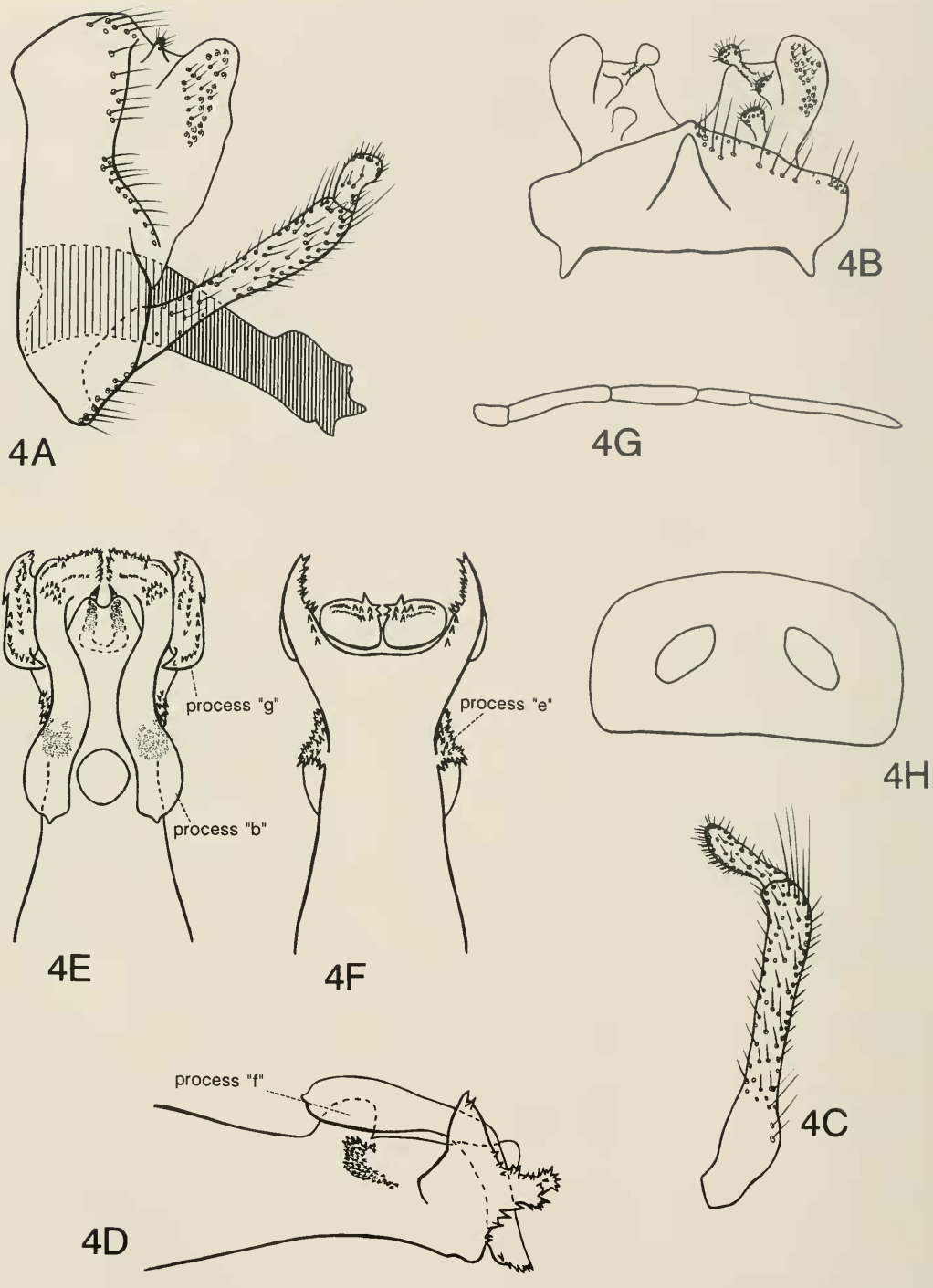

Fig. 4. *Leptonema rafita*, male genitalia. A, Lateral view. B, Segments IX, X, dorsal view. C, Inferior appendage, posteroventral view. D, Phallus, lateral view. E, Phallus, dorsal view. F, Phallus, ventral view. G, Maxillary palpus, lateral view. H, Sternum V, ventral view.

Map 2. Distribution of *Leptonema flintorum*, *L. huismanae*, and *L. tapanti*.

Also, Dr. Holzenthal has added enormously to the knowledge of the caddisfly fauna of Costa Rica, where he is called affectionately "Rafita."

Leptonema tapanti Muñoz-Q., new species
(Fig. 5, Map 2)

Diagnosis.—*Leptonema tapanti* is the first species of the *stigmosum* Group of Flint et al. (1987) recorded from Costa Rica. This new species is close to *L. auriculatum* Flint, McAlpine, and Ross of the same group, but is also similar to *L. michoacanense* Flint, McAlpine, and Ross, *L. plicatum* Mosely, and *L. simplex* Mosely of the *plicatum* Group. However, it can be distinguished from those species by the shape of processes "*b*" and "*c*" of the phallus. In *L. tapanti*, processes "*b*" and "*c*" are fused into a lightly sclerotized, apicolateral, inflated, paired lobes; as viewed dorsally, process "*b-c*" is earlike, enlarged, and concave dorsolaterally at its middle. The lateral margin is convexly curved, with the apices pointed and directed posteriorly, and with a slender, curved, midlateral projection. In *L. auriculatum*, *L. michoacanense*, *L. plica-*

tum, and *L. simplex*, processes "*b*" and "*c*" are not fused. In *L. auriculatum*, process "*b*" is a small dorsal angle; process "*c*" is smaller, rounded, and earlike; in *L. michoacanense*, process "*b*" is long, slender, basally curved and with a pointed apex; process "*c*" is shorter, slender, curved basally; in *L. plicatum*, process "*b*" is long, slender, curved basally and with a pointed apex; process "*c*" is absent; and in *L. simplex*, process "*b*" is short; as viewed laterally, it is subtriangular with a pointed apex directed anterodorsally; process "*c*" is absent. Finally, in this new species, as viewed dorsally, process "*b-c*" has a slender, curved, midlateral projection, with the apex pointed and directed mesally; a similar projection is absent in the other species.

Description.—*Male:* Length of forewing 17–20 mm. Body sclerites pale brown. Dorsum of head pale brown with short, light brown setae. Leg segments with fine, light brown setae. Wings light brown, translucent; forewing sparsely covered, mainly between anal veins, with fine, short, brown setae, with two small rounded patches of darker setae, one over each nygma. Maxillary palpus with fifth segment about ½ length of basal 4 segments combined. Process of sternum V very small, circular. *Genitalia* (Fig. 5): Segment IX, as viewed laterally, narrow, elongate; as viewed dorsally, with V-shaped dorsal keel, dorsal margin slightly projecting posteromesally. Segment X with wart "*a*" absent; warts "*b-1*" and "*b-2*" short with small setae; wart "*c*" absent; lateral lobes, as viewed dorsally, each with pair of apical points, projecting posteriorly; as viewed laterally, bearing short setae on lateral margin. Inferior appendage two segmented, basal segment less than 3 times length of apical segment; apical segment with short setae on inner margin. Phallus with midsection long, tubular; apical section bearing two, tiny, sharply pointed, sclerotized phallotremal sclerites behind process "*a*", visible in dorsal view; process "*a*", as viewed dorsally, broad, rounded, membranous, arising dorsomesally, and emarginate apicomesally, trilobed; lateral lobes of process "*a*" broad, with lateral margin slightly convex; mesal lobe of process "*a*" slender; as viewed laterally, lateral lobes of process "*a*", rounded and directed dorsally; mesal lobe of process "*a*" rounded, higher, directed anterodorsally, and reaching posteromesal spicules of mesal row of spicules of process "*e*"; processes "*b*" and "*c*" fused into lightly sclerotized, apicolateral, inflated, paired lobes; as viewed dorsally, process "*b-c*" earlike, enlarged, concave dorsolaterally at middle, lateral margin convexly curved, apices pointed, directed posteriorly, and with slender, curved, midlateral projection with pointed apex, directed mesally; ventrally, with deep, narrowly V-shaped, apicomesal emargination; process "*e*" dorsolateral, fused to phallobase; as viewed dorsally, developed into three elongated rows of spicules, one mesal and Y-shaped, and two lateral ones ending in rounded, membranous, dorsal, and anteriorly directed lobes, with small spicules; processes "*d*", "*f*", "*g*" and "*j*" absent.

Type material.—Holotype: ♂ COSTA RICA: *Cartago:* Reserva Tapantí, Quebrada Palmitos and falls, 9.72°N, 83.78°W, 1400 m, 24–25.iii.1991, Holzenthal, Muñoz, Huisman (NMNH). Paratypes: COSTA RICA: *Cartago:* same data as holotype except, Río Grande de Orosi, 9.686°N, 83.756°W, el. 1650 m, 18–21.iii.1987, Holzenthal, Hamilton, Heyn, 1 ♂, 1 ♀ (UMSP); same except, Río Dos Amigos and falls, ca. 6 km (road) NW tunnel, 9.704°N, 83.783°W, 1500 m, 23.iii.1991, Holzenthal, Muñoz, Huisman 1 ♂, 1 ♀ (UMSP); same data as holotype except, 10 ♂, 2 ♀ (UMSP); same except, 21.ii.1992, Holzenthal, Muñoz Kjer, 1 ♂, 3 ♀ (INBIO). PANAMA: *Chiriquí:* Guadalupe Arriba, 8°52′26″N, 82°33′13″W, 1–28.ii.1984, H. Wolda, 3 ♂, 4 ♀ (NMNH); same except, 29.ii.–27.iii.1984, 3 ♂, 5 ♀ (NMNH); same except, 3–30.iv.1984, 1 ♂, 8 ♀ (NMNH); same except, 2–29.v.1984, 2 ♂, 3 ♀ (NMNH); same except, 30.v.–19.vi.1984, 2

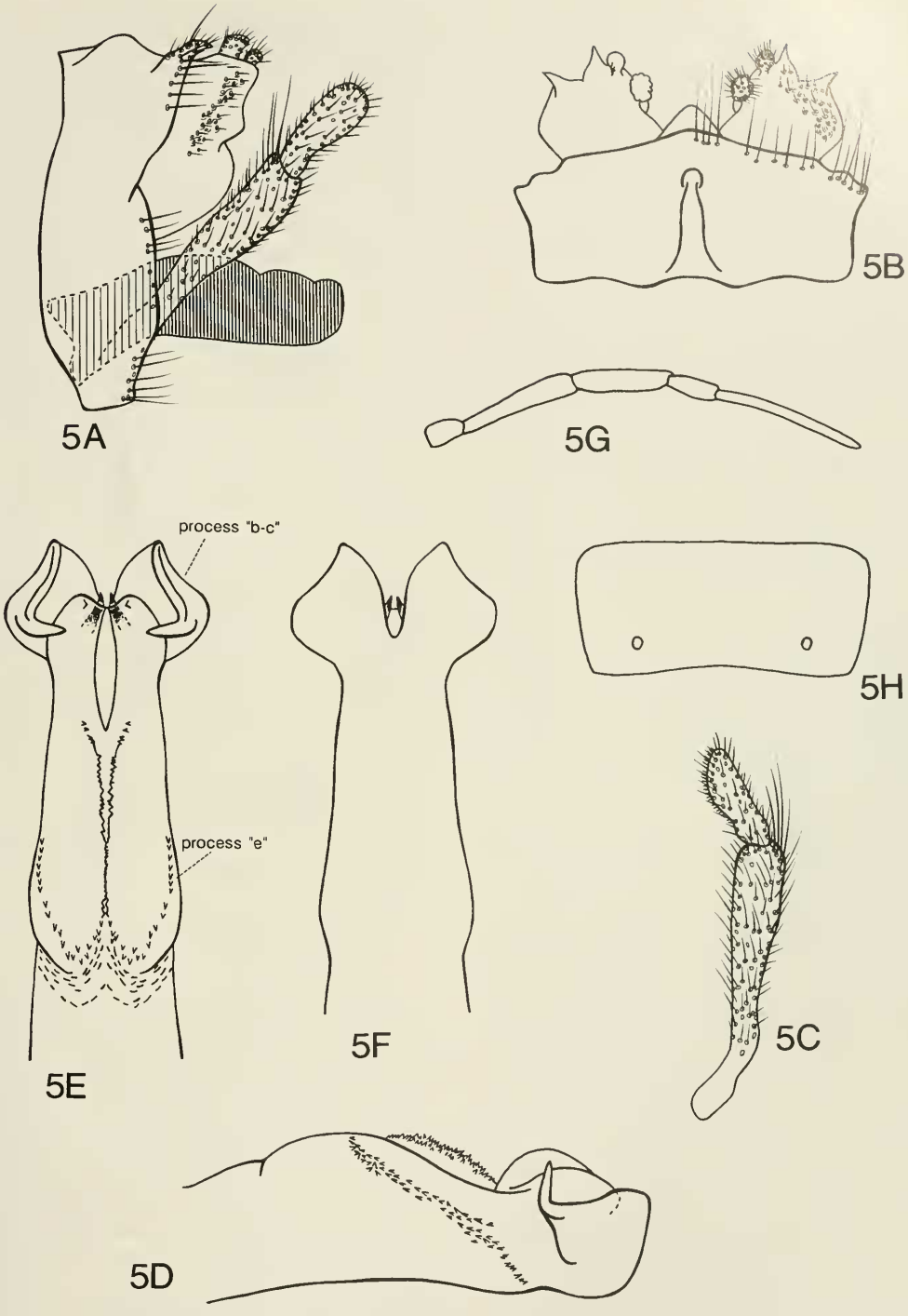

Fig. 5. *Leptonema tapanti*, male genitalia. A, Lateral view. B, Segments IX, X, dorsal view. C, Inferior appendage, posteroventral view. D, Phallus, lateral view. E, Phallus, dorsal view. F, Phallus, ventral view. G, Maxillary palpus, lateral view. H, Sternum V, ventral view.

♂ (NMNH); same except, 15–28.v.1985, 2 ♂, 2 ♀ (NMNH); same except, 15–18.vi.1985, 3 ♂ (NMNH); same except, 14–29.viii.1985, 1 ♂, 1 ♀ (NMNH).

Etymology.—Named for the type locality, Tapantí National Park, which has a rich and endemic caddisfly fauna.

Leptonema cheesmanae Mosely
(Fig. 6, Map 1)

Leptonema cheesmanae Mosely 1933: 51–52, figs. 148–153, ♂, I. Gorgona, Colombia (BMNH); McElravy et al. 1981: 153; 1982: 307.

Distribution.—Colombia, Panama, Costa Rica (new record).

Diagnosis.—This species is a member of the *complexum* Group, as defined by Flint et al. (1987). *Leptonema cheesmanae* is very similar to *L. clorito* n. sp., differing from that species in the shape of process "*d*" of the phallic apparatus and the shape of the lateral lobes of segment X, as viewed dorsally, as described in the diagnosis of *L. clorito*. Also, this species can be separated from *L. harpagum* Flint, McAlpine, and Ross by the shape of process "*a*", which in *L. cheesmanae*, is unilobed, as viewed dorsally, process "*a*" is tonguelike, elongate, slender and arising dorsomesally; as viewed laterally, it is fingerlike, arched, with the apex truncated. In *L. harpagum*, process "*a*" is bilobed and prominent. In figure 153 from Mosely (1933) of *L. cheesmanae*, process "*f*" is not illustrated, but it does appear in his figure 152. However, in figure 152 it is not possible to see process "*e-1*", only process "*e-2*".

New distribution records.—COSTA RICA: *Alajuela:* Cerro Campana, ca. 6 km (air) NW Dos Ríos, 10.9°N, 85.4°W, el. 640 m, 15–16.iii.1986, Holzenthal and Fasth, 1 ♂ (UMSP); Reserva Forestal San Ramón, Río San Lorencito and tribs., 10.216°N, 84.607°W, el. 980 m, 2–4.vii.1986, Holzenthal, Heyn, Armitage, 5 ♂ (UMSP); same except, 5–9.vii.1986, I. and A. Chacón, 1 ♂ (UMSP); same except, 2–6.ix.1986, I. and A. Chacón, 9 ♂, 11 ♀ (UMSP); same except, 1–4.vii.1986, I. and A. Chacón, 2 ♂, 1 ♀ (UMSP); same except, 24–27.ii.1987, I. and A. Chacón, 2 ♂ (UMSP); same except, 30.iii.1987, Holzenthal, Hamilton, Heyn, 2 ♂ (in alcohol) (INBIO); same except, 1–4.v.1990, Holzenthal, Blahnik, 28 ♂ (10 in alcohol), 3 ♀ (UMSP); same except, 28–30.vii.1990, Holzenthal, Blahnik, Muñoz, 3 ♂, 12 ♀ (UMSP); same except, 6–10.iii.1991, Holzenthal, Muñoz, Huisman, 4 ♂, 9 ♀ (UMSP); *Guanacaste:* Parque Nacional Guanacaste, Estación Pitilla, Río Orosi, 10.991°N, 85.428°W, el. 700 m, 22–25.v.1990, Holzenthal and Blahnik, 1 ♂ (UMSP); same except, Estación Maritza, Río Tempisquito, 10.958°N, 85.497°W, el. 550 m, 16.ii.1994, F. Muñoz-Q., 4 ♂, 3 ♀ (in alcohol) (INBIO); *Limón:* Reserva Biológica Hitoy Cerere, Estación Miramar, 9.671°N, 83.030°W, el. 550 m, 11.xii.1990, F. Muñoz-Q., 1 ♂ (UMSP); *San José:* P.[arque] N.[acional] Braulio Carrillo, Est.[ación] Carrillo, Q.[uebrada] Sanguijuela, 10.160°N, 83.963°W, el. 800 m, 22–28.viii.1986, I. and A. Chacón, 3 ♂, 1 ♀ (UMSP); same except, 27.iii.1987, Holzenthal, Hamilton, Heyn, 4 ♂ (UMSP).

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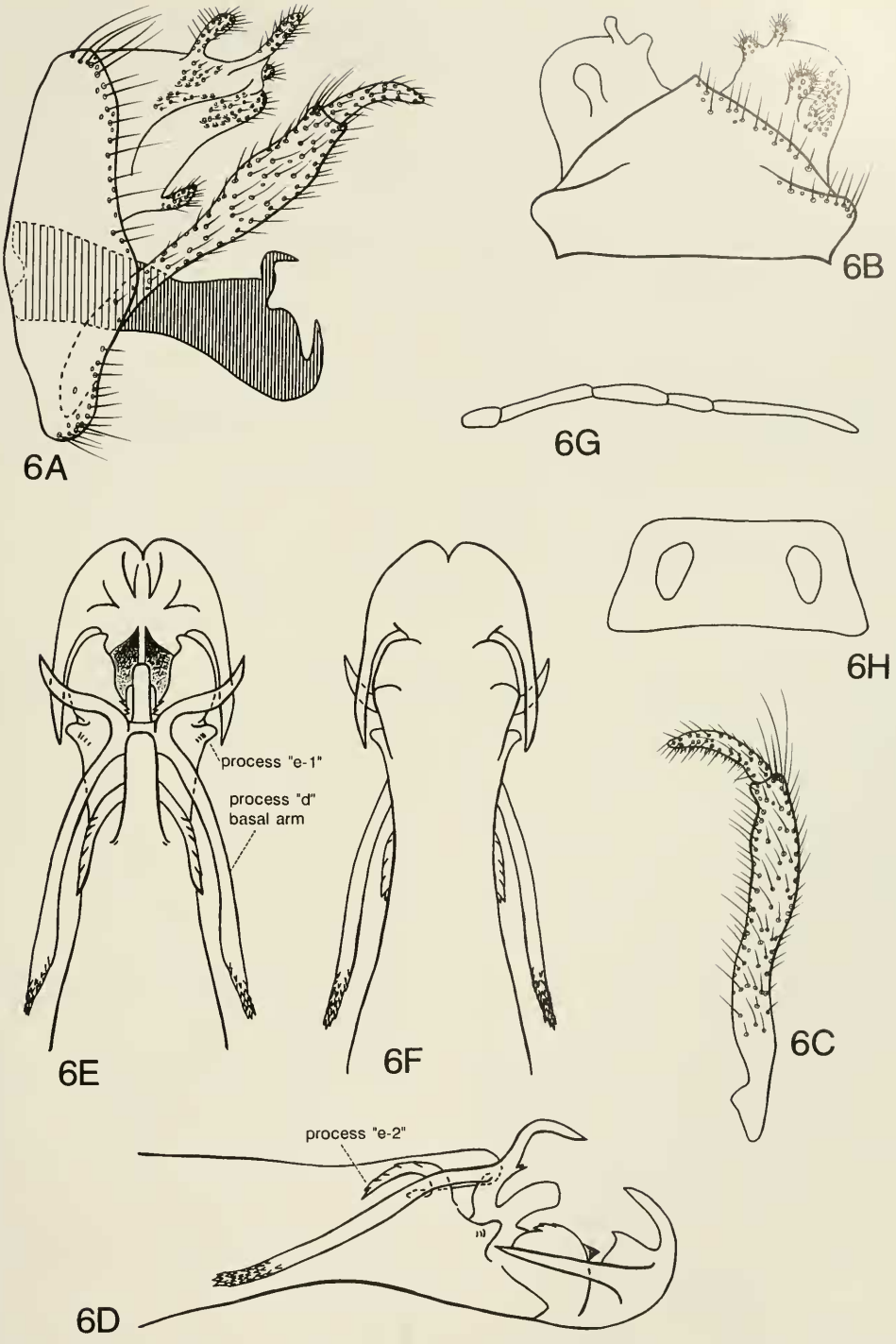

Fig. 6. *Leptonema cheesmanae*, male genitalia. A, Lateral view. B, Segments IX, X, dorsal view. C, Inferior appendage, posteroventral view. D, Phallus, lateral view. E, Phallus, dorsal view. F, Phallus, ventral view. G, Maxillary palpus, lateral view. H, Sternum V, ventral view.

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